July 31, 2000

David L. Arnold
Mailcode 3AP21
EPA Region III Office
1650 Arch St.
Philadelphia, PA 19103

Dear Mr. Arnold,

The attached comments from ELM Packaging Company are being submitted in reference to the revised State Implementation Plan for the Philadelphia-Wilmington-Trenton Ozone Non-attainment Area. These comments were prepared following a meeting with the U.S. EPA Ozone Policy and Strategy Group in Durham, North Carolina. It was the opinion of the Ozone Policy and Strategy Group that the emission reductions represented by the technology referred to in the comments would be a valuable addition to the revised State Implementation Plan for this non-attainment area. We would welcome the opportunity to provide more detailed information on the technology and potential reduction of emissions at your convenience. We can be reached through Jim Bartholomew at 903 856 2399.

Respectfully,

James O. Bartholomew

Comments on 40 CFR Part 52
[PA117-4095,FRL-6502-6]
Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; One-Hour Ozone Attainment Demonstration for the Philadelphia-Wilmington-Trenton Ozone Non-Attainment Area

ELM Packaging Company appreciates the opportunity to comment on the Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; One-Hour Ozone Attainment Demonstration for the Philadelphia-Wilmington-Trenton Ozone Non-Attainment Area. These comments are being made at the suggestion of the USEPA Ozone Policy and Strategy Group in Durham, NC. This suggestion came as a result of a meeting held between ELM Packaging Company, a manufacturer of foam foodservice products, and the Ozone Policy and Strategy Group on July 11, 2000.

ELM Packaging Company is a U.S. owned and operated company that produces foodservice and packaging products such as tableware, school lunch trays, hinged takeout containers, food trays, and egg cartons from extruded polystyrene foam sheet. The company has been business for over 30 years. Approximately seven years ago ELM packaging, along with several other manufacturers, converted their foam extrusion process to use a recently developed non-polluting blowing agent. The blowing agent is a soluble gas, which creates the cell within the foam structure. However, the remainder of the industry continued to use hydrocarbons, a known air pollutant, as their blowing agent. As a result of the continued use of hydrocarbon blowing agents in this application, approximately 25,000 tons per year of VOC's are emitted within the United States each year. Because most of the emissions from these products occurs after the product leaves the manufacturing plant, and because most of these products are used in highly populated areas, a high percentage of the emissions occur in non-attainment areas. Complete industry conversion to the non-polluting blowing agent alternative would totally eliminate the entire 25,000 tons per year of emissions.

The process that we recommend, to achieve these VOC emission reductions, involves the use of HFC-152a (1,1,diflouroethane) as the blowing agent. This process was developed, as a result of concerns for the ozone depletion potential of CFC-12 and HCFC-22, as a joint effort of the foam industry and raw material suppliers, including polystyrene and blowing agent manufacturers, sponsored by the Technical Committee of the Foodservice and Packaging Institute. As a result of the efforts of that committee, the foodservice and packaging industry was able to convert from ozone depleting compounds well ahead of the schedule mandated by regulations. ELM was a member of that committee during the development. HFC-152a was determined to be the best alternative that met the requirements of having zero ozone depletion potential and being a non-VOC. Through extensive trials with ELM and several other companies, it was determined that HFC-152a technically performed well as a blowing agent for this process. The same basic manufacturing equipment could be used with only minor modifications to the operating conditions. The products manufactured were of comparable quality. No increase in the weight of the product was required, and no loss of process performance was incurred.

Processing costs were determined to be similar. The product costs were essentially unaffected except for the increased raw material cost of the blowing agent itself. However, this was offset by the elimination of the requirement to purchase and operate emissions control equipment that would be necessary if conversion to hydrocarbons were chosen. The effectiveness of this process is demonstrated by the fact that ELM, and others, have been successfully marketing these products against hydrocarbon blown products for seven years.

ELM would like to point out that some capital costs were incurred with the conversion to HFC-152a. For example, based on the experience of the companies that converted, we know that it cost approximately 70,000 to 75,000 dollars per extrusion line to accomplish the installation. However, most of that money was required to accommodate fire safety requirements to use the flammable blowing agent. The actual cost to convert to the new blowing agent was only ten thousand dollars per line. But because hydrocarbon blowing agents are also flammable, converting to hydrocarbons would have been equally as expensive. For manufacturers who currently use flammable blowing agents, we estimate the conversion cost would be no greater than the ten thousand dollars per line experienced by the companies that have already made the change. The equipment costs to convert a plant from hydrocarbons to HFC-152a involve only the following:

1. Possibly a bulk storage tank, if the existing tank is not rated for the appropriate pressure.
2. Changeout of elastomer gaskets that contact the blowing agent. This is a simple and inexpensive procedure.
3. Changing the gas detection sensors to the infrared type, if the equipment is not already compatible with HFC-152a.

These conversion costs apply to the retrofit of an existing facility. A new facility would not experience any difference in construction cost based on the selection of the blowing agent.

In conclusion, the technology exists to convert plants producing extruded polystyrene foam sheet from hydrocarbons to a non-VOC blowing agent in a cost-effective and quality effective manner. Technical assistance is available to accomplish the conversion from Du Pont or a number of consultants who are experienced in the art. The cost of conversion would be a fraction of the cost per annual ton deemed acceptable by regulatory agencies, and therefore, would easily fall within normal cost/benefit guidelines. ELM, and others, made what we believe was the environmentally correct decision on blowing agents seven years ago and accepted the associated conversion costs. We have competed in the marketplace against hydrocarbon blown foams ever since and we have demonstrated the viability of the process. We believe all manufacturers should meet that same standard. We respectfully request that this potential reduction be included in the area plan.

ELM Packaging Company would be happy to meet with you, at your convenience, to give you more detailed information on how these emissions occur, the manufacturing process, and provide you with an estimate of the emission reductions possible within the non-attainment area in question.

Attached as an addendum to these comments is a copy of the Environmental Claim Certification issued by the California Air Resources Board for this process. This certification is the culmination of a significant third party independent evaluation of the environmental claims we make for our process and products. Hopefully, this independent certification will eliminate any concerns you might have for the validity of the information we have provided in these comments.

I look forward to meeting with you in the near future. You may contact me for more information or to schedule meeting by calling Jim Bartholomew at 903 856 2399 or at PO Box 1007, Pittsburg, TX 75686.

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
2020 L Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Winston H. Hickox
Agency Secretary

Gray Davis
Governor

April 5, 2000

Dear Air Pollution Control Officer:

I am pleased to enclose a copy of an Executive Order that has been issued to the ELM Packaging Company for their extruded polystyrene foam sheet. These Executive Orders were issued as part of the Air Resources Board's (ARB's) Equipment and Process Precertification (Precertification) Program, a voluntary fee-based statewide program for manufacturers of commonly-used equipment or processes. Specifically, the Executive Orders document our verification of the air quality-related claims for this extruded polystyrene foam sheet when it is produced during normal manufacturing conditions.

Under the Precertification Program, manufacturers request that the ARB conduct an independent third-party verification of performance claims which focus on the air quality benefits of their equipment or process. If the claim is verified, the manufacturer is free to refer to the results of the ARB staff's evaluation in its marketing literature. Upon successful completion of the verification process, the ARB staff notifies the air pollution control and air quality management districts of the ARB's determination.

The enclosed evaluation report discusses the process used by the ELM Packaging Company in the production of its extruded polystyrene foam sheet, the performance claims verified by the ARB, the emissions estimation techniques and results, and the findings and recommendations of the ARB staff concerning the ELM foam sheet.

Our staff has evaluated the air quality-related performance of this technology, and has verified the following claims:

> "The ELM Packaging Company does not use a blowing agent that contains volatile organic compounds (as defined by the California Air Resources Board and the United States Environmental Protection Agency) in the manufacture of its extruded polystyrene foam sheet. Therefore, the blowing agent used in the manufacture of ELM Packaging Company extruded polystyrene foam sheet does not contribute to the formation of tropospheric (ground-level) ozone."
>
> "The ELM Packaging Company does not use stratospheric (upper-level) ozone-depleting substances (as defined by the United States Environmental Protection Agency) as a blowing agent when it manufactures its extruded polystyrene foam sheet during normal manufacturing conditions."

This technology represents a departure from the rest of the industry, which uses volatile organic compounds or ozone-depleting substances as blowing agents. The ELM Packaging Company's extruded polystyrene foam sheet is used to thermo-form hinged lid containers (for "take-out" from restaurants); food (poultry, produce, and meat) trays; institutional plates, bowls, platters, and lunch trays; and retail egg cartons.

We believe that the type of technology discussed in this letter presents an opportunity to reduce the formation of ground-level ozone and the depletion of stratospheric ozone. If you have any questions about the enclosed Executive Order, Evaluation Report, or the Precertification Program, please contact Mr. Richard Corey at (916) 323-1079 or myself at (916) 322-6026.

Sincerely,

Raymond E. Menebroker, Chief
Project Assessment Branch

Enclosures

cc: Mr. Richard Corey, ARB

State of California
AIR RESOURCES BOARD
Executive Order G-096-029-032
Equipment Precertification of
ELM Packaging Company
Extruded Polystyrene Foam Sheet

WHEREAS, the Air Resources Board (ARB) has established a statewide Equipment and Process Precertification (Precertification) Program to assist air pollution control and air quality management districts in meeting the requirements of the Air Pollution Permit Streamlining Act (California Health and Safety Code section 42320-42323);

WHEREAS, the ARB has been given the authority under the California Health and Safety Code section 39620 to develop and implement the Precertification Program which consists of a preliminary engineering evaluation of equipment or processes and provides recommended operating conditions;

WHEREAS, this Precertification does not constitute an air pollution permit or eliminate the responsibility of the end user to comply with all federal, state, and local laws, rules and regulations;

WHEREAS, the ELM Packaging Company has requested a Precertification of its extruded polystyrene foam sheet, manufactured during normal manufacturing conditions using 1,1-difluoroethane (HFC-152a) as the blowing agent;

WHEREAS, the ELM Packaging Company identified the following Precertification standards regarding the emissions performance of its extruded polystyrene foam sheet: The ELM Packaging Company does not use a blowing agent that contains volatile organic compounds (as defined by the California Air Resources Board and the United States Environmental Protection Agency) in the manufacture of its extruded polystyrene foam sheet; therefore, the blowing agent used in the manufacture of the ELM Packaging Company extruded polystyrene foam sheet does not contribute to the formation of tropospheric (ground-level) ozone. The ELM Packaging Company does not use stratospheric (upper-level) ozone-depleting substances (as defined by the United States Environmental Protection Agency) as a blowing agent when it manufactures its extruded polystyrene foam sheet during normal manufacturing conditions;

WHEREAS, this Precertification is valid only when the ELM Packaging Company extruded polystyrene foam sheet is manufactured during normal manufacturing conditions using HFC-152a as the blowing agent;

WHEREAS, I find that the Applicant, the ELM Packaging Company, has met the requirements specified in Title 17 California Code of Regulations section 91400 which incorporate the ARB's Criteria for Equipment Precertification (Adopted June 14, 1996) and has satisfactorily demonstrated through independent testing that the extruded polystyrene foam sheet described in the application meets the identified Precertification standards;

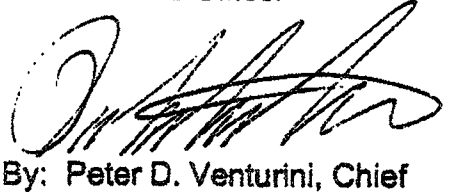
WHEREAS, this performance Precertification is subject to all conditions and requirements of the ARB's Criteria for Equipment Precertification, including the provisions relating to suspension and revocation;

WHEREAS, marketing of this device using an identification other than that shown in this Executive Order shall be prohibited unless prior approval is obtained from the ARB. Any oral or written references to this Executive Order or its content by the ELM Packaging Company, its principals, agents, employees, distributors, dealers, or other representatives must include the disclaimer that this Executive Order is not an endorsement or approval of the ELM Packaging Company extruded polystyrene foam sheet. No claim shall be made, such as, "Approved by the Air Resources Board" with respect to any advertising or other oral or written communication. It is only a finding that the ELM Packaging Company extruded polystyrene foam sheet meets the identified Precertification standard, as specified in the evaluation report for application number 05219901;

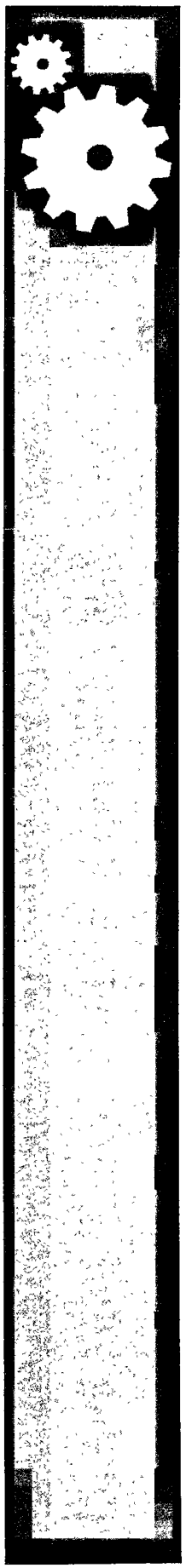
WHEREAS, this performance Precertification shall expire three years from the date of this Executive Order, unless renewed.

NOW THEREFORE, IT IS HEREBY ORDERED, that the performance Precertification, Executive Order G-096-029-032, executed at Sacramento, California this 14th day of February, 2000, is hereby granted.

Michael P. Kenny
Executive Officer



By: Peter D. Venturini, Chief
Stationary Source Division



California Environmental Protection Agency

Air Resources Board

EQUIPMENT AND PROCESS PRECERTIFICATION PROGRAM

EVALUATION OF THE AIR QUALITY PERFORMANCE CLAIMS FOR THE ELM PACKAGING COMPANY EXTRUDED POLYSTYRENE FOAM SHEET

FEBRUARY 2000

Equipment:	**Extruded Polystyrene Foam Sheet**
Applicant:	**ELM Packaging Company** 5837 Distribution Drive Memphis, Tennessee 38141
Applicant Contact:	Mr. Don McCann
Title:	President
Phone Number:	(901) 795-2711
E-mail:	dmelm@aol.com
Website:	www.elmpackaging.com
Application Number:	05219901
Executive Order Number:	G-096-029-032
Executive Order Date:	February 14, 2000
Air Resources Board Contact:	Ms. Kitty Martin
Phone Number:	(916) 322-3907
E-mail:	kmartin@arb.ca.gov
ARB Website:	www.arb.ca.gov
Precertification Website	www.arb.ca.gov/eqpr/eqpr.htm

ABSTRACT

The purpose of this report is to document the California Air Resources Board's (ARB's) evaluation and verification of the air quality-related claims made by the ELM Packaging Company concerning its Extruded Polystyrene Foam Sheet.

In an effort to make progress towards attaining healthy air quality in California, regulations restrict emissions of volatile organic compounds (VOCs) from a broad spectrum of activities. VOCs are emitted directly as by-products of combustion-related activities or as fugitive emissions from sources such as petrochemical operations and solvent-containing products.

In an effort to slow the depletion of stratospheric ozone, the United States Environmental Protection Agency (U.S. EPA) administers several voluntary and regulatory programs covering the production, phaseout, recycling, handling, and substitution of stratospheric (upper-level) ozone-depleting substances.

The reduction of VOC emissions from all sources and the support of U.S. EPA's stratospheric ozone protection programs are part of California's clean air strategy to achieve and maintain healthy air quality in California.

As part of its Equipment and Process Precertification (Equipment Precertification) Program application package, the ELM Packaging Company requested that the ARB evaluate its proposed performance claim with respect to the fact that they do not use a blowing agent that contains VOCs in the manufacture of its extruded polystyrene foam sheet, and thus do not contribute to the formation of tropospheric (ground-level) ozone. In addition, the ELM Packaging Company requested that the ARB evaluate its proposed performance claim that it does not use stratospheric (upper level) ozone-depleting substances as a blowing agent during normal manufacturing conditions for its extruded polystyrene foam sheet.

Upon successful completion of the requirements associated with the ARB's Equipment Precertification Program, a report is issued with two companion documents— an Executive Order and a certificate. These documents serve as official records that the ARB has independently verified the applicant's performance claims. Executive Orders earned under the ARB's Equipment Precertification Program are valid for three years from the date issued, presuming the holder complies with: 1) the terms and conditions identified in this report and 2) the general requirements discussed in the Equipment Precertification Program Guidelines and Criteria.

After review of the documents discussed throughout this report, the ARB recommends that a Precertification certificate be issued for the ELM Packaging Company Extruded Polystyrene Foam Sheet.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD

EQUIPMENT AND PROCESS PRECERTIFICATION PROGRAM

EVALUATION OF THE AIR QUALITY PERFORMANCE CLAIMS FOR THE ELM PACKAGING COMPANY EXTRUDED POLYSTYRENE FOAM SHEET

FEBRUARY 2000

Table of Contents

I. INTRODUCTION

This report discusses the technology used by the ELM Packaging Company in the production of its Extruded Polystyrene Foam Sheet (ELM foam sheet), the performance claims to be verified by the Air Resources Board (ARB), the emissions estimation techniques and results, and the findings and recommendations of the ARB staff concerning the ELM foam sheet.

This report is organized into several sections. The proceeding section, General Information, provides background information on the ARB's Equipment and Process Precertification (Precertification) Program. The next three sections: Summary of Scope; Statement of Claims; and Description of Technology; discuss the breadth of our evaluation, the performance claims for the ELM foam sheet, and a detailed description of the ELM foam sheet.

The following two sections: Technical Evaluation and Evaluation of Claims present detailed information on our technical review and assessment of the ELM foam sheet. The sections entitled: Quality Management and Environmental and Economic Benefits provide supporting information on the ELM Packaging Company's procedures to produce a foam sheet that meets the company's claims and a brief assessment of the potential environmental and economic impacts of the technology.

Finally, the remaining sections: Recommendations and Precertification Conditions discuss the ARB staff's determination of the performance of the ELM foam sheet relative to the company's claims. These sections also provide some guidance with respect to the specific conditions that must be met for the certificate to remain valid for three years. Appendix A contains a listing of the information that we relied upon to conduct our evaluation. Appendix B contains some of the detailed information that supports the evaluation in this report.

II. GENERAL INFORMATION

Under the regulations established for the program, equipment or processes eligible for Precertification must: 1) have an air quality benefit; 2) be commonly-used or have the potential to be commonly-used in the near future (market ready); and 3) not pose a significant potential hazard to public health and safety and the environment. Furthermore, to be eligible, applicants for the program must demonstrate that they have sufficient control over the manufacture of the equipment or process to ensure that they can consistently and reliably produce equipment which performs at least as well as that considered in this evaluation.

A. Equipment Precertification Program Background

The Equipment Precertification Program is a voluntary statewide program for manufacturers of commonly-used equipment or processes. A precondition for entry into the program is that the equipment has an air quality benefit. On June 14, 1996, the ARB adopted section 91400 of the California Code of Regulations which incorporates the Criteria for Equipment and Process Precertification (Criteria). The regulation and Criteria were approved by the California Office of Administrative Law on October 31, 1996 and became effective on November 30, 1996.

Under the Equipment Precertification Program, manufacturers request that the ARB conduct an independent third-party verification of performance claims which focus on the air quality benefits of its equipment or process. If the claim is verified, the manufacturer is free to refer to the results of the ARB staff's evaluation in its marketing literature. Upon successful completion of the verification process, air pollution control and air quality management districts (Districts) in California are notified of the ARB's determination. As a result of the ARB's notification, the Districts have an advanced opportunity to become familiar with the performance of the equipment or process.

On May 21, 1999, the ELM Packaging Company requested that the ARB staff determine if the ELM foam sheet was eligible for the Equipment Precertification program. After receiving confirmation from the ARB staff that the ELM foam sheet was eligible for the program, the ELM Packaging Company submitted a Precertification application package. As part of our review of the application package, we evaluated formulation, manufacturing, and other information concerning the performance of the ELM foam sheet to determine whether the claims were verifiable.

B. Relationship to Air Quality

1. Emissions of Volatile Organic Compounds

As defined by the ARB and the United States Environmental Protection Agency (U.S. EPA), volatile organic compounds (VOCs) are any compounds containing at least one atom of carbon, except the exempt compounds listed in Appendix B. VOCs are emitted directly as by-products of incomplete combustion or as fugitive emissions from sources such as petro-chemical operations and solvent-containing products. Through a series of complex reactions, VOCs function as chemical precursors to the formation of tropospheric (ground-level) ozone.

Repeated exposure to ozone may cause permanent damage to the lungs. Even at relatively low concentrations, ozone triggers a variety of health problems including chest pains, coughing, nausea, throat irritation, and congestion. It can also worsen bronchitis, heart disease, emphysema, asthma, and reduce lung capacity. Ozone interferes with the ability of plants to produce and store food, making them more susceptible to disease, insects, and other pollutants.

2. Stratospheric Ozone-depleting Substances

The earth's stratosphere extends from about 10 to 50 kilometers above the earth's surface. Most stratospheric ozone is concentrated at about 15 to 30 kilometers above the earth's surface. This ozone layer absorbs a portion of the ultraviolet (UV) radiation produced by the sun.

UV radiation is a portion of the electromagnetic spectrum with wavelengths shorter than visible light. UV radiation is commonly split into three bands: UV-A, UV-B, and UV-C. UV-A is not absorbed by ozone. UV-B is mostly absorbed by ozone, although some reaches the earth. UV-C is completely absorbed by ozone and oxygen (O_2). Depletion of stratospheric ozone allows more UV-B radiation to reach the earth's surface.

Exposure to UV-B radiation has been

linked to various skin cancers; cataracts; suppression of the human immune system; damage to crops, materials, and aquatic organisms.

Stratospheric ozone-depleting substances (ODSs) are carried intact up to the stratosphere where they break down under the effect of direct sunlight to produce radicals (reactive molecules having an unpaired electron.) The radicals released by this chemical decomposition react with ozone molecules in the ozone layer and convert them into O_2. O_2 does not have a protective effect against UV-B. Because of their chemical stability, ODSs do not break down or function in the lower atmosphere as chemical precursors to ground-level ozone.

ODSs include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, carbon tetrachloride, and methyl chloroform. Hydrofluorocarbons (HFCs), such as HFC-152a (1,1-difluoroethane), are not ODSs.

The U.S. EPA administers several voluntary and regulatory programs covering the production, phaseout, recycling, handling, and substitution of ODSs. These programs use an index called the ozone depletion potential (ODP) that indicates how many ozone molecules will be destroyed by the release of one kilogram of a given product, compared to one kilogram of CFC-11.

The ODP for CFC-11 is 1.0. HCFC-123 (2,2-dichloro-1,1,1-trifluoroethane) and HCFC-124 (2-chloro-1,1,1,2-tetrafluoroethane) have the lowest ODP (0.02) of ODSs, while Halon 1301 (bromotrifluoromethane) has the highest ODP (10.0).

HCFC-22 has an ODP of 0.05. In response to the U.S. EPA deadlines for phasing out the manufacture, import, and use of many ODSs, many industries have substituted volatile organic compounds or non-ozone depleting HFCs, such as HFC-152a, for ODSs that were historically used in their processes.

The reduction of VOC emissions from all sources is part of California's clean air strategy to achieve and maintain healthy air quality in California. Because the ELM foam sheet is manufactured without using reactive VOCs or ODSs as a blowing agent during normal operating conditions, the ARB evaluated the ELM foam sheet as air pollution control equipment.

Districts in California do not require that an air quality permit be obtained prior to the distribution, purchase, or use of a foam sheet product.

C. Health and Environmental Impacts

As part of our evaluation, staff conducted a cursory review of the potential environmental impacts associated with the ELM foam sheet. Based on this review, we concluded that the ELM foam sheet would not likely present health impacts significantly different from those associated with other foam sheets that are currently in wide use throughout California. Please note that the ELM Packaging Company and its distributors of the ELM foam sheet are required to meet all applicable health and safety standards with respect to the manufacture, storage, transport, and use

of the ELM foam sheet.

D. Manufacture/Ownership Rights
The recommendations in this report are contingent upon the ELM Packaging Company having the legal rights to produce and/or market the ELM foam sheet. The ELM Packaging Company documented its ownership of these rights in their Eligibility Request, received by the ARB on May 21, 1999.

III. SUMMARY OF SCOPE

Historically, extruded polystyrene foam sheet has been manufactured using VOCs (usually n-pentane, iso-pentane, iso-butane, and n-butane) or ODSs as the blowing agents. The ELM Packaging Company claims that by using HFC 152-a, instead of VOCs or ODSs as the blowing agent during normal manufacturing conditions, their foam sheet does not contribute to the formation of ground-level ozone or the depletion of stratospheric ozone.

IV. STATEMENT OF CLAIMS

The following are the claims verified by ARB staff concerning the ELM Packaging Company's foam sheet. The verification of these claims are predicated on the presumption that the ELM foam sheet is manufactured, transported, stored, and used in accordance with manufacturer's instructions.

1. The ELM Packaging Company does not use a blowing agent that contains volatile organic compounds (as defined by the California Air Resources Board and the United States Environmental Protection Agency) in the manufacture of its extruded polystyrene foam sheet. Therefore, the blowing agent used in the manufacture of ELM Packaging Company extruded polystyrene foam sheet does not contribute to the formation of tropospheric (ground-level) ozone.

2. The ELM Packaging Company does not use stratospheric (upper-level) ozone-depleting substances (as defined by the United States Environmental Protection Agency) as a blowing agent when it manufactures its extruded polystyrene foam sheet during normal manufacturing conditions.

V. DESCRIPTION OF TECHNOLOGY

A. Product Composition
The raw materials used to produce extruded polystyrene foam sheet include crystal polystyrene plastic resin in pellet form, a blowing agent in liquid or gaseous form, and an inorganic nucleating agent.

Among the properties that a blowing agent must possess are solubility in polystyrene plastic and an appropriate vapor pressure that will allow controlled formation of the cells in the foam sheet. (The cells in plastic foam sheet provide strength, insulation capability, and weight reduction). Non-ODS blowing agents include VOCs (usually n-pentane, iso-pentane, iso-butane, and n-butane); carbon dioxide, HFC-152a; and a blend of these substances.

The ELM Packaging Company does not use carbon dioxide as a blowing agent because its solubility in polystyrene is insufficient to achieve the product rigidity requirements of its customers. The ELM Packaging Company uses HFC-152a as the blowing agent in the production of

their foam sheet. HFC-152a is manufactured by E. I. DuPont de Nemours and Company (DuPont) under the trade name of Formacel® Z-2. The purchase price of HFC-152a from DuPont includes a license (U.S. Patent number 5,147,896) for using it as a blowing agent in the process for making polystyrene foams. In addition to HFC-152a, the ELM Packaging Company uses Dupont's Formacel® HCFC-22 (chorodifluoromethane) when restarting the extruder after any safety lockouts related to flammability concerns occur.

The purpose of the nucleating agent is to provide discontinuity sites in the molten plastic for the formation of the bubbles or cells. The ELM Packaging Company uses finely divided talc or micro-encapsulated sodium bicarbonate and citric acid, which form minute amounts of carbon dioxide within the molten polymer.

On a weight basis, the plastic represents approximately 94 to 96 percent of the raw materials, the blowing agent approximately 4 to 6 percent, and the nucleating agent is less than 0.25 percent.

B. Manufacturing Procedures

Currently, The ELM Packaging Company has three manufacturing sites (Fullerton, California; Memphis, Tennessee; and Troy, Ohio) for the production of the foam sheet that is the subject of this evaluation. In addition, The ELM Packaging Company plans to build another manufacturing facility in Phoenix, Arizona. The ELM Packaging Company has used the manufacturing process for the foam sheet described in this evaluation for six years.

The polystyrene plastic pellets that the ELM Packaging Company uses in its manufacturing process for foam sheet are either virgin material or trim (either in fluff or pellet form) material obtained in-house. The trim material can account for as much as 60 percent of the polystyrene used in the process. The ratio of virgin to trim material varies depending upon the amount of trim available at the time of production.

The polystyrene pellets (along with the nucleating agent) are introduced into a rotating screw extruder where it is melted and mixed to produce a uniform molten plastic mass at temperatures between 300 and 400 degrees Fahrenheit and pressures in the range of 2000 to 3000 (pounds per square inch (psi). The blowing agent (HFC-152a) is injected into the molten plastic at high pressure while it is still in the rotating screw extruder. The product quality is related to maintaining the proper ratio between the polystyrene beads and the blowing agent in the extruder. The plastic and blowing agent are thoroughly mixed to form a homogeneous solution. This solution is then transferred to a second rotating screw extruder, via an enclosed pipe, where it is subsequently cooled to a uniform temperature in the range of about 200 degrees Fahrenheit. The molten plastic and blowing agent solution is forced through a ring-shaped die. The solution exits the die at about 1,000 to 2,000 psi into a region of atmospheric pressure.

Upon exiting the die, the blowing agent comes out of solution and forms small bubbles, or cells, in the plastic, thus creating the foam. The foam tube is then drawn over a sizing and cooling mandrel where the plastic is solidified

and the growth of the cells is halted. The foam tube is then slit on both sides and flattened out to produce two separate polystyrene foam sheets. The sheets are then rolled up into large rolls, removed from the extrusion line, and aged for 4 to 8 days. The aging process allows ambient air to enter most of the foam cells and achieve equilibrium. No reclamation of offgassed HFC-152a is conducted.

After aging, the foam sheet is reheated and thermoformed into food service items. These items include hinged lid containers (for "take-out" from restaurants); food (poultry, produce, and meat) trays; institutional plates, bowls, platters, and lunch trays; and retail egg cartons. The items are then stacked, packaged, stored, and shipped to a series of warehouses and distribution centers until reaching the customers. The manufactured foam sheeting offgasses approximately 15 to 20 percent of the blowing agent prior to shipment from the manufacturing plant and the remaining after the various food service items are shipped.

VI. TECHNICAL EVALUATION

A. Facility Visit

As part of our evaluation, the ARB staff visited the ELM Manufacturing Company foam sheet manufacturing facility in Fullerton, California. During our visit, we observed the manufacturing practices and site layout and confirmed the ELM statements that during normal manufacturing conditions, their foam sheet is manufactured using only HFC - 152a as the blowing agent. The ARB staff confirmed that there were onsite storage facilities only for the blowing agents described in this evaluation.

As mentioned earlier, the ELM Packaging Company uses Dupont's Formacel® HCFC-22 (chorodifluoromethane) when restarting the extruder after any safety lockouts related to flammability concerns occur. Although upset conditions such as these are rare, the ELM Packaging Company maintains an onsite cylinder of HCFC-22 for these purposes.

Finally, the ARB staff confirmed that the overall manufacturing standards and practices at the ELM Packaging Company facility were being carried out as they were described in the application that had been submitted to the ARB for this evaluation.

B. Records Review

As part of our evaluation, the ARB staff reviewed the MSDS sheet for Dupont's Formacel® Z-2 and confirmed that it is indeed HFC-152a. In addition, the ARB staff reviewed bills of lading and related documents provided by the ELM Packaging Company that confirmed that the blowing agent that they receive is, in fact, HFC-152a. Finally, the ARB reviewed the ELM Packaging Company manufacturing facility employee instructions for inspecting shipping documents (which include results of independent lab analyses) to confirm the content of the bulk deliveries of HFC-152a.

VII. EVALUATION OF CLAIMS

This section presents additional information relating to the claim verified by the ARB as part of this evaluation report. Our verification of this claim is based on our evaluation of the information listed in Appendix A. As stated earlier, the ARB's evaluation and recommendations presented in this report are predicated on

the expectation that the ELM foam sheet is transported, stored, and used in accordance with the manufacturer's instructions. The claim language is precise because it directly correlates with the supporting documentation included with the application package. Below each claim are supporting comments, which may be used to interpret the significance of the claims verified in this report. To assist the reader, each portion of the claim is displayed in bold text.

1. **The ELM Packaging Company does not use volatile organic compounds (as defined by the California Air Resources Board and the United States Environmental Protection Agency) in the manufacture of its extruded polystyrene foam sheet. Therefore, the ELM Packaging Company extruded polystyrene foam sheet does not contribute to the formation of tropospheric (ground-level) ozone.**

In addition to conducting a site visit at an ELM Packaging Company manufacturing facility, the ARB staff reviewed formulation information and bill of lading records related to the production of extruded polystyrene foam sheet. Based on this information, the ARB staff has determined that destructive testing was not necessary to verify the type of blowing agent in the ELM Packaging Company polystyrene foam sheet. As such, the blowing agent used in the manufacture of the ELM Packaging Company polystyrene foam sheet is not expected to contribute to the formation of tropospheric (ground-level) ozone.

2. **The ELM Packaging Company does not use stratospheric (upper-level) ozone-depleting substances (as defined by the United States Environmental Protection Agency) when it manufactures its extruded polystyrene foam sheet during normal manufacturing conditions.**

In addition to conducting a site visit at the ELM Packaging Company manufacturing facility in Fullerton, California, the ARB staff reviewed formulation information and bill of lading records related to the production of extruded polystyrene foam sheet. Based on this information, the ARB staff determined that destructive testing was not necessary to verify the type of blowing agent used in the manufacture of the ELM Packaging Company polystyrene foam sheet. As such, the ELM Packaging Company polystyrene foam sheet is not expected to contribute to the depletion of stratospheric ozone, as a result of normal manufacturing conditions.

It should be noted, that the ELM Packaging Company is approved by the U.S. EPA to use very small amounts of Dupont's Formacel® HCFC-22 (an ozone-depleting substance) when restarting the extruder after any safety lockouts related to flammability occur. U.S. EPA allows the use of HCFC-22 as a startup substance because, currently, there are no alternative startup substances that do not pose a flammability concern. In 1999, the ELM Packaging Company's use of HCFC-22 as a startup substance averaged about 68 pounds per week at their Fullerton manufacturing facility.

VIII. QUALITY MANAGEMENT

A. Practices and Standards

The ARB staff reviewed quality management information submitted by the ELM Packaging Company. The quality objectives of the end user of foam sheet food service products relate to its ability to hold food without bending or breaking. Minimum and maximum specifications for thickness and weight are the primary quality activities that are practiced by the ELM Packaging Company. The ELM Packaging Company uses caliper measurements and batch weights to monitor the achievement of their target specifications. These specifications allow surveillance of how effectively the HFC-152a is mixed with the polystyrene beads in the extruder, and ensures that product rigidity is achieved.

The ELM Packaging Company has developed target ratios for the amount of talc and polystyrene that match the specifications that each customer outlines for their product. The operator of each extruder varies the amount of HFC-152a as needed to achieve the weight and thickness specifications established by the customer.

When the ELM Packaging Company manufacturing facilities receive a shipment of HFC-152a, it is accompanied by the results of an independent lab analysis to confirm content. During transfer of HFC-152a from a bulk delivery truck to an onsite tank, the ELM Packaging Company manufacturing site workers confirm (by inspecting shipping documents) that the correct material has been delivered.

After evaluating the quality management information provided by the ELM Packaging Company, the ARB staff has determined that sufficiently-comprehensive measures are used in the manufacturing process for the ELM foam sheet to ensure that ingredient quality, manufacturing process consistency, and finished product quality are achieved and maintained.

As part of our evaluation, the ARB staff visited an ELM foam sheet manufacturing facility in Fullerton, California. During our visit, we observed the manufacturing practices and confirmed the ELM Packaging Company's statements that under normal manufacturing conditions, their foam sheet is manufactured using only HFC-152a as the blowing agent.

B. Other Certifications/Approvals

The December 10, 1993, edition of the Federal Register announced the promulgation of a final rule amending section 178.3010 of the Food Additive Regulations (21 CFR) to permit the use of HFC-152a as a blowing agent in the manufacture of foamed polystyrene.

C. Warranties

The ELM Packaging Company will replace any product sold that is subsequently determined to not meet manufacturing specifications (i.e. if there is a manufacturing defect.)

IX. ENVIRONMENTAL AND ECONOMIC BENEFITS

As part of our review, we evaluated the potential air quality impacts of the ELM foam sheet. Under normal manufacturing conditions, most extruded polystyrene foam sheet products are produced using VOCs (usually n-pentane, iso-pentane, iso-butane, and n-butane) or ODSs as the blowing agents. By using

HFC 152-a, instead of VOCs or ODSs during normal manufacturing conditions, the ELM Packaging Company foam sheet blowing agent does not contribute to the formation of ground-level ozone or the depletion of stratospheric ozone. Although HFC 152-a has a global warming potential, it is an order of magnitude less than HCFC-22, the blowing agent that was previously used as the blowing agent for ELM foam sheet under normal manufacturing condtions.

X. RECOMMENDATIONS

After evaluating the information discussed in this report, the ARB staff recommends that the ELM foam sheet be precertified under its Precertification Program. Specifically, we have independently verified the claims of the ELM Packaging Company concerning its foam sheet, as presented in the claims section of the report.

By accepting Precertification under the ARB's program, the ELM Packaging Company assumes, for the duration of the three-year Precertification period, responsibility for maintaining the quality of the manufactured equipment and materials at a level equal or better than was provided to obtain this Precertification. Precertification under the ARB's program is also contingent on the recipient agreeing to be subject to quality monitoring by the ARB, as provided by law.

The ARB makes no express or implied warranties as to the performance of the manufacturer's product or equipment. Nor, does the ARB warrant that the manufacturer's product or equipment is free from any defects in workmanship or material caused by negligence, misuse, accident, or other causes. The ARB staff believes, however that the ELM Packaging Company's foam sheet will achieve the performance levels presented in the claims section of this report. Our determination is based on our evaluation of the data submitted by the ELM Packaging Company, as well as, other information identified in this report. Our recommendations are predicated on the expectation that the foam sheet is produced in accordance with manufacturer's specifications.

XI. PRECERTIFICATION CONDITIONS

The recommendations in this report are conditional upon the ELM Packaging Company foam sheet being manufactured, transported, stored, and used in accordance with the ELM Packaging Company's recommendations. In addition, these recommendations are conditional upon the ELM Packaging Company using HCFC-22 in the manufacturing process only during startup conditions after a safety lockout resulting from flammability concerns. In order for the Precertification to remain valid, the ELM Packaging Company must retain the manufacturing rights for the ELM Packaging foam sheet.

APPENDIX A

MATERIALS AVAILABLE FOR EVALUATION

APPENDIX A
MATERIALS AVAILABLE FOR EVALUATION

1. Request to Determine Eligibility for the ARB Precertification of Equipment or Processes from Mr. Jim Bartholomew of the ELM Packaging Company, received May 21, 1999.
2. Letter from Mr. Richard Corey of the ARB to Mr. Jim Bartholomew of the ELM Packaging Company notifying the ELM Packaging Company that the ELM Packaging Company extruded polystyrene sheet foam was eligible for the ARB Precertification of Equipment or Process Program and transmitting an estimate of fees required for Precertification, June 21, 1999.
3. Application for the ARB Equipment and Process Precertification Program from Mr. Jim Bartholomew of the ELM Packaging Company transmitting an application fee and the ARB Precertification Program Application, dated September 17, 1999.
4. Copy of a slide presentation from Mr. Jim Bartholomew of the ELM Packaging Company that provided general information on the ELM Packaging Company extruded polystyrene sheet foam manufacturing process, September 30, 1999.
5. Field notes from the ARB staff site visit to the ELM Packaging Company manufacturing facility at Fullerton, California, October 13, 1999.
6. Letter from Mr. Richard Corey of the ARB to Mr. Jim Bartholomew of the ELM Packaging Company notifying the ELM Packaging Company of additional information requirements needed in order to complete the ARB Equipment and Process Precertification Program application submitted by the ELM Packaging Company, October 22, 1999.
7. Letter from Mr. Jim Bartholomew of the ELM Packaging Company transmitting additional information requirements requested by the ARB, October 22, 1999.
8. Letter from Mr. Richard Corey of the ARB to Mr. Jim Bartholomew of the ELM Packaging Company notifying the ELM Packaging Company that its application was sufficiently complete, November 2, 1999.

APPENDIX B

DEFINITION OF VOLATILE ORGANIC COMPOUNDS

APPENDIX B
DEFINITION OF VOLATILE ORGANIC COMPOUNDS

The United States Environmental Protection Agency and the California Air Resources Board define volatile organic compounds as any compound that contains at least one atom of carbon, except the following exempt compounds.

acetone
ethane
methyl acetate
parachlorobenzotrifluoride (1-chloro-4-trifluoromethyl benzene)
perchloroethylene (tetrachloroethylene)
carbon monoxide
carbon dioxide
carbonic acid
metallic carbides or carbonates
ammonium carbonate
methane
methylene chloride (dichloromethane)
1,1,1-trichloroethane (methyl chloroform)
trichlorofluoromethane (CFC-11)
dichlorodifluoromethane (CFC-12)
1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)
1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114)
chloropentafluoroethane (CFC-115)
chlorodifluoromethane (HCFC-22)
1,1,1-trifluoro-2,2-dichloroethane (HCFC-123)
1,1-dichloro-1-fluoroethane (HCFC-141b)
1-chloro-1,1-difluoroethane (HCFC-142b)
2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)
trifluoromethane (HFC-23)
1,1,2,2-tetrafluoroethane (HFC-134)
1,1,1,2-tetrafluoroethane (HFC-134a)
pentafluoroethane (HFC-125)
1,1,1-trifluoroethane (HFC-143a)
1,1-difluoroethane (HFC-152a)
cyclic, branched, or linear completely methylated siloxanes
cyclic, branched, or linear, completely fluorinated alkanes
cyclic, branched, or linear, completely fluorinated ethers with no unsaturations
cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations
sulfur-containing perfluorocarbons with no unsaturations and with the sulfur bonds to carbon and fluorine

Comments on 40 CFR Part 52
[PA117-4095,FRL-6502-6]
Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; One-Hour Ozone Attainment Demonstration for the Philadelphia-Wilmington-Trenton Ozone Non-Attainment Area

ELM Packaging Company appreciates the opportunity to comment on the Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; One-Hour Ozone Attainment Demonstration for the Philadelphia-Wilmington-Trenton Ozone Non-Attainment Area. These comments are being made at the suggestion of the USEPA Ozone Policy and Strategy Group in Durham, NC. This suggestion came as a result of a meeting held between ELM Packaging Company, a manufacturer of foam foodservice products, and the Ozone Policy and Strategy Group on July 11, 2000.

ELM Packaging Company is a U.S. owned and operated company that produces foodservice and packaging products such as tableware, school lunch trays, hinged takeout containers, food trays, and egg cartons from extruded polystyrene foam sheet. The company has been business for over 30 years. Approximately seven years ago ELM packaging, along with several other manufacturers, converted their foam extrusion process to use a recently developed non-polluting blowing agent. The blowing agent is a soluble gas, which creates the cell within the foam structure. However, the remainder of the industry continued to use hydrocarbons, a known air pollutant, as their blowing agent. As a result of the continued use of hydrocarbon blowing agents in this application, approximately 25,000 tons per year of VOC's are emitted within the United States each year. Because most of the emissions from these products occurs after the product leaves the manufacturing plant, and because most of these products are used in highly populated areas, a high percentage of the emissions occur in non-attainment areas. Complete industry conversion to the non-polluting blowing agent alternative would totally eliminate the entire 25,000 tons per year of emissions.

The process that we recommend, to achieve these VOC emission reductions, involves the use of HFC-152a (1,1,diflouroethane) as the blowing agent. This process was developed, as a result of concerns for the ozone depletion potential of CFC-12 and HCFC-22, as a joint effort of the foam industry and raw material suppliers, including polystyrene and blowing agent manufacturers, sponsored by the Technical Committee of the Foodservice and Packaging Institute. As a result of the efforts of that committee, the foodservice and packaging industry was able to convert from ozone depleting compounds well ahead of the schedule mandated by regulations. ELM was a member of that committee during the development. HFC-152a was determined to be the best alternative that met the requirements of having zero ozone depletion potential and being a non-VOC. Through extensive trials with ELM and several other companies, it was determined that HFC-152a technically performed well as a blowing agent for this process. The same basic manufacturing equipment could be used with only minor modifications to the operating conditions. The products manufactured were of comparable quality. No increase in the weight of the product was required, and no loss of process performance was incurred.

Processing costs were determined to be similar. The product costs were essentially unaffected except for the increased raw material cost of the blowing agent itself. However, this was offset by the elimination of the requirement to purchase and operate emissions control equipment that would be necessary if conversion to hydrocarbons were chosen. The effectiveness of this process is demonstrated by the fact that ELM, and others, have been successfully marketing these products against hydrocarbon blown products for seven years.

ELM would like to point out that some capital costs were incurred with the conversion to HFC-152a. For example, based on the experience of the companies that converted, we know that it cost approximately 70,000 to 75,000 dollars per extrusion line to accomplish the installation. However, most of that money was required to accommodate fire safety requirements to use the flammable blowing agent. The actual cost to convert to the new blowing agent was only ten thousand dollars per line. But because hydrocarbon blowing agents are also flammable, converting to hydrocarbons would have been equally as expensive. For manufacturers who currently use flammable blowing agents, we estimate the conversion cost would be no greater than the ten thousand dollars per line experienced by the companies that have already made the change. The equipment costs to convert a plant from hydrocarbons to HFC-152a involve only the following:

1. Possibly a bulk storage tank, if the existing tank is not rated for the appropriate pressure.
2. Changeout of elastomer gaskets that contact the blowing agent. This is a simple and inexpensive procedure.
3. Changing the gas detection sensors to the infrared type, if the equipment is not already compatible with HFC-152a.

These conversion costs apply to the retrofit of an existing facility. A new facility would not experience any difference in construction cost based on the selection of the blowing agent.

In conclusion, the technology exists to convert plants producing extruded polystyrene foam sheet from hydrocarbons to a non-VOC blowing agent in a cost-effective and quality effective manner. Technical assistance is available to accomplish the conversion from Du Pont or a number of consultants who are experienced in the art. The cost of conversion would be a fraction of the cost per annual ton deemed acceptable by regulatory agencies, and therefore, would easily fall within normal cost/benefit guidelines. ELM, and others, made what we believe was the environmentally correct decision on blowing agents seven years ago and accepted the associated conversion costs. We have competed in the marketplace against hydrocarbon blown foams ever since and we have demonstrated the viability of the process. We believe all manufacturers should meet that same standard. We respectfully request that this potential reduction be included in the area plan.

ELM Packaging Company would be happy to meet with you, at your convenience, to give you more detailed information on how these emissions occur, the manufacturing process, and provide you with an estimate of the emission reductions possible within the non-attainment area in question.

Attached as an addendum to these comments is a copy of the Environmental Claim Certification issued by the California Air Resources Board for this process. This certification is the culmination of a significant third party independent evaluation of the environmental claims we make for our process and products. Hopefully, this independent certification will eliminate any concerns you might have for the validity of the information we have provided in these comments.

I look forward to meeting with you in the near future. You may contact me for more information or to schedule meeting by calling Jim Bartholomew at 903 856 2399 or at PO Box 1007, Pittsburg, TX 75686.

Winston H. Hickox
Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
2020 L Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor

April 5, 2000

Dear Air Pollution Control Officer:

I am pleased to enclose a copy of an Executive Order that has been issued to the ELM Packaging Company for their extruded polystyrene foam sheet. These Executive Orders were issued as part of the Air Resources Board's (ARB's) Equipment and Process Precertification (Precertification) Program, a voluntary fee-based statewide program for manufacturers of commonly-used equipment or processes. Specifically, the Executive Orders document our verification of the air quality-related claims for this extruded polystyrene foam sheet when it is produced during normal manufacturing conditions.

Under the Precertification Program, manufacturers request that the ARB conduct an independent third-party verification of performance claims which focus on the air quality benefits of their equipment or process. If the claim is verified, the manufacturer is free to refer to the results of the ARB staff's evaluation in its marketing literature. Upon successful completion of the verification process, the ARB staff notifies the air pollution control and air quality management districts of the ARB's determination.

The enclosed evaluation report discusses the process used by the ELM Packaging Company in the production of its extruded polystyrene foam sheet, the performance claims verified by the ARB, the emissions estimation techniques and results, and the findings and recommendations of the ARB staff concerning the ELM foam sheet.

Our staff has evaluated the air quality-related performance of this technology, and has verified the following claims:

> "The ELM Packaging Company does not use a blowing agent that contains volatile organic compounds (as defined by the California Air Resources Board and the United States Environmental Protection Agency) in the manufacture of its extruded polystyrene foam sheet. Therefore, the blowing agent used in the manufacture of ELM Packaging Company extruded polystyrene foam sheet does not contribute to the formation of tropospheric (ground-level) ozone."
>
> "The ELM Packaging Company does not use stratospheric (upper-level) ozone-depleting substances (as defined by the United States Environmental Protection Agency) as a blowing agent when it manufactures its extruded polystyrene foam sheet during normal manufacturing conditions."

This technology represents a departure from the rest of the industry, which uses volatile organic compounds or ozone-depleting substances as blowing agents. The ELM Packaging Company's extruded polystyrene foam sheet is used to thermo-form hinged lid containers (for "take-out" from restaurants); food (poultry, produce, and meat) trays; institutional plates, bowls, platters, and lunch trays; and retail egg cartons.

We believe that the type of technology discussed in this letter presents an opportunity to reduce the formation of ground-level ozone and the depletion of stratospheric ozone. If you have any questions about the enclosed Executive Order, Evaluation Report, or the Precertification Program, please contact Mr. Richard Corey at (916) 323-1079 or myself at (916) 322-6026.

Sincerely,

Raymond E. Menebroker, Chief
Project Assessment Branch

Enclosures

cc: Mr. Richard Corey, ARB

State of California
AIR RESOURCES BOARD
Executive Order G-096-029-032
Equipment Precertification of
ELM Packaging Company
Extruded Polystyrene Foam Sheet

WHEREAS, the Air Resources Board (ARB) has established a statewide Equipment and Process Precertification (Precertification) Program to assist air pollution control and air quality management districts in meeting the requirements of the Air Pollution Permit Streamlining Act (California Health and Safety Code section 42320-42323);

WHEREAS, the ARB has been given the authority under the California Health and Safety Code section 39620 to develop and implement the Precertification Program which consists of a preliminary engineering evaluation of equipment or processes and provides recommended operating conditions;

WHEREAS, this Precertification does not constitute an air pollution permit or eliminate the responsibility of the end user to comply with all federal, state, and local laws, rules and regulations;

WHEREAS, the ELM Packaging Company has requested a Precertification of its extruded polystyrene foam sheet, manufactured during normal manufacturing conditions using 1,1-difluoroethane (HFC-152a) as the blowing agent;

WHEREAS, the ELM Packaging Company identified the following Precertification standards regarding the emissions performance of its extruded polystyrene foam sheet: The ELM Packaging Company does not use a blowing agent that contains volatile organic compounds (as defined by the California Air Resources Board and the United States Environmental Protection Agency) in the manufacture of its extruded polystyrene foam sheet; therefore, the blowing agent used in the manufacture of the ELM Packaging Company extruded polystyrene foam sheet does not contribute to the formation of tropospheric (ground-level) ozone. The ELM Packaging Company does not use stratospheric (upper-level) ozone-depleting substances (as defined by the United States Environmental Protection Agency) as a blowing agent when it manufactures its extruded polystyrene foam sheet during normal manufacturing conditions;

WHEREAS, this Precertification is valid only when the ELM Packaging Company extruded polystyrene foam sheet is manufactured during normal manufacturing conditions using HFC-152a as the blowing agent;

WHEREAS, I find that the Applicant, the ELM Packaging Company, has met the requirements specified in Title 17 California Code of Regulations section 91400 which incorporate the ARB's Criteria for Equipment Precertification (Adopted June 14, 1996) and has satisfactorily demonstrated through independent testing that the extruded polystyrene foam sheet described in the application meets the identified Precertification standards;

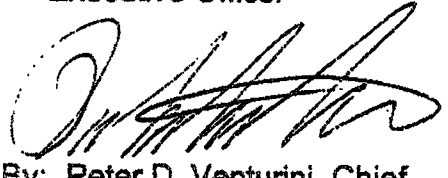
WHEREAS, this performance Precertification is subject to all conditions and requirements of the ARB's Criteria for Equipment Precertification, including the provisions relating to suspension and revocation;

WHEREAS, marketing of this device using an identification other than that shown in this Executive Order shall be prohibited unless prior approval is obtained from the ARB. Any oral or written references to this Executive Order or its content by the ELM Packaging Company, its principals, agents, employees, distributors, dealers, or other representatives must include the disclaimer that this Executive Order is not an endorsement or approval of the ELM Packaging Company extruded polystyrene foam sheet. No claim shall be made, such as, "Approved by the Air Resources Board" with respect to any advertising or other oral or written communication. It is only a finding that the ELM Packaging Company extruded polystyrene foam sheet meets the identified Precertification standard, as specified in the evaluation report for application number 05219901;

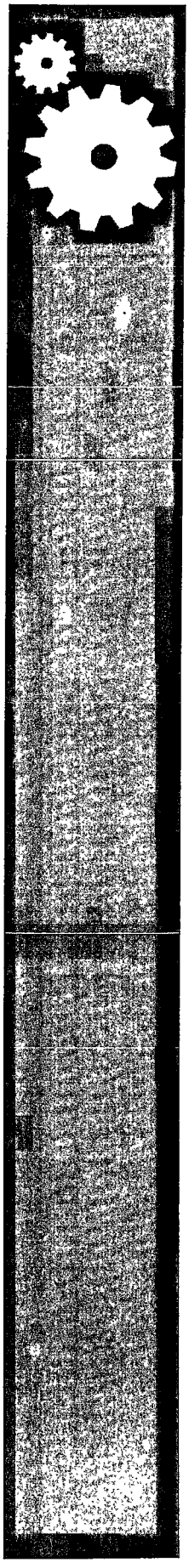
WHEREAS, this performance Precertification shall expire three years from the date of this Executive Order, unless renewed.

NOW THEREFORE, IT IS HEREBY ORDERED, that the performance Precertification, Executive Order G-096-029-032, executed at Sacramento, California this 14th day of February, 2000, is hereby granted.

Michael P. Kenny
Executive Officer



By: Peter D. Venturini, Chief
Stationary Source Division



California Environmental Protection Agency

Air Resources Board

EQUIPMENT AND PROCESS PRECERTIFICATION PROGRAM

EVALUATION OF THE AIR QUALITY PERFORMANCE CLAIMS FOR THE ELM PACKAGING COMPANY EXTRUDED POLYSTYRENE FOAM SHEET

FEBRUARY 2000

Equipment:	**Extruded Polystyrene Foam Sheet**
Applicant:	**ELM Packaging Company** 5837 Distribution Drive Memphis, Tennessee 38141
Applicant Contact:	Mr. Don McCann
Title:	President
Phone Number:	(901) 795-2711
E-mail:	dmelm@aol.com
Website:	www.elmpackaging.com
Application Number:	05219901
Executive Order Number:	G-096-029-032
Executive Order Date:	February 14, 2000
Air Resources Board Contact:	Ms. Kitty Martin
Phone Number:	(916) 322-3907
E-mail:	kmartin@arb.ca.gov
ARB Website:	www.arb.ca.gov
Precertification Website	www.arb.ca.gov/eqpr/eqpr.htm

ABSTRACT

The purpose of this report is to document the California Air Resources Board's (ARB's) evaluation and verification of the air quality-related claims made by the ELM Packaging Company concerning its Extruded Polystyrene Foam Sheet.

In an effort to make progress towards attaining healthy air quality in California, regulations restrict emissions of volatile organic compounds (VOCs) from a broad spectrum of activities. VOCs are emitted directly as by-products of combustion-related activities or as fugitive emissions from sources such as petrochemical operations and solvent-containing products.

In an effort to slow the depletion of stratospheric ozone, the United States Environmental Protection Agency (U.S. EPA) administers several voluntary and regulatory programs covering the production, phaseout, recycling, handling, and substitution of stratospheric (upper-level) ozone-depleting substances.

The reduction of VOC emissions from all sources and the support of U.S. EPA's stratospheric ozone protection programs are part of California's clean air strategy to achieve and maintain healthy air quality in California.

As part of its Equipment and Process Precertification (Equipment Precertification) Program application package, the ELM Packaging Company requested that the ARB evaluate its proposed performance claim with respect to the fact that they do not use a blowing agent that contains VOCs in the manufacture of its extruded polystyrene foam sheet, and thus do not contribute to the formation of tropospheric (ground-level) ozone. In addition, the ELM Packaging Company requested that the ARB evaluate its proposed performance claim that it does not use stratospheric (upper level) ozone-depleting substances as a blowing agent during normal manufacturing conditions for its extruded polystyrene foam sheet.

Upon successful completion of the requirements associated with the ARB's Equipment Precertification Program, a report is issued with two companion documents— an Executive Order and a certificate. These documents serve as official records that the ARB has independently verified the applicant's performance claims. Executive Orders earned under the ARB's Equipment Precertification Program are valid for three years from the date issued, presuming the holder complies with: 1) the terms and conditions identified in this report and 2) the general requirements discussed in the Equipment Precertification Program Guidelines and Criteria.

After review of the documents discussed throughout this report, the ARB recommends that a Precertification certificate be issued for the ELM Packaging Company Extruded Polystyrene Foam Sheet.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD

EQUIPMENT AND PROCESS PRECERTIFICATION PROGRAM

EVALUATION OF THE AIR QUALITY PERFORMANCE CLAIMS FOR THE ELM PACKAGING COMPANY EXTRUDED POLYSTYRENE FOAM SHEET

FEBRUARY 2000

Table of Contents

I. INTRODUCTION

This report discusses the technology used by the ELM Packaging Company in the production of its Extruded Polystyrene Foam Sheet (ELM foam sheet), the performance claims to be verified by the Air Resources Board (ARB), the emissions estimation techniques and results, and the findings and recommendations of the ARB staff concerning the ELM foam sheet.

This report is organized into several sections. The proceeding section, General Information, provides background information on the ARB's Equipment and Process Precertification (Precertification) Program. The next three sections: Summary of Scope; Statement of Claims; and Description of Technology; discuss the breadth of our evaluation, the performance claims for the ELM foam sheet, and a detailed description of the ELM foam sheet.

The following two sections: Technical Evaluation and Evaluation of Claims present detailed information on our technical review and assessment of the ELM foam sheet. The sections entitled: Quality Management and Environmental and Economic Benefits provide supporting information on the ELM Packaging Company's procedures to produce a foam sheet that meets the company's claims and a brief assessment of the potential environmental and economic impacts of the technology.

Finally, the remaining sections: Recommendations and Precertification Conditions discuss the ARB staff's determination of the performance of the ELM foam sheet relative to the company's claims. These sections also provide some guidance with respect to the specific conditions that must be met for the certificate to remain valid for three years. Appendix A contains a listing of the information that we relied upon to conduct our evaluation. Appendix B contains some of the detailed information that supports the evaluation in this report.

II. GENERAL INFORMATION

Under the regulations established for the program, equipment or processes eligible for Precertification must: 1) have an air quality benefit; 2) be commonly-used or have the potential to be commonly-used in the near future (market ready); and 3) not pose a significant potential hazard to public health and safety and the environment. Furthermore, to be eligible, applicants for the program must demonstrate that they have sufficient control over the manufacture of the equipment or process to ensure that they can consistently and reliably produce equipment which performs at least as well as that considered in this evaluation.

A. Equipment Precertification Program Background

The Equipment Precertification Program is a voluntary statewide program for manufacturers of commonly-used equipment or processes. A precondition for entry into the program is that the equipment has an air quality benefit. On June 14, 1996, the ARB adopted section 91400 of the California Code of Regulations which incorporates the Criteria for Equipment and Process Precertification (Criteria). The regulation and Criteria were approved by the California Office of Administrative Law on October 31, 1996 and became effective on November 30, 1996.

Under the Equipment Precertification Program, manufacturers request that the ARB conduct an independent third-party verification of performance claims which focus on the air quality benefits of its equipment or process. If the claim is verified, the manufacturer is free to refer to the results of the ARB staff's evaluation in its marketing literature. Upon successful completion of the verification process, air pollution control and air quality management districts (Districts) in California are notified of the ARB's determination. As a result of the ARB's notification, the Districts have an advanced opportunity to become familiar with the performance of the equipment or process.

On May 21, 1999, the ELM Packaging Company requested that the ARB staff determine if the ELM foam sheet was eligible for the Equipment Precertification program. After receiving confirmation from the ARB staff that the ELM foam sheet was eligible for the program, the ELM Packaging Company submitted a Precertification application package. As part of our review of the application package, we evaluated formulation, manufacturing, and other information concerning the performance of the ELM foam sheet to determine whether the claims were verifiable.

B. Relationship to Air Quality

1. Emissions of Volatile Organic Compounds

As defined by the ARB and the United States Environmental Protection Agency (U.S. EPA), volatile organic compounds (VOCs) are any compounds containing at least one atom of carbon, except the exempt compounds listed in Appendix B. VOCs are emitted directly as by-products of incomplete combustion or as fugitive emissions from sources such as petro-chemical operations and solvent-containing products. Through a series of complex reactions, VOCs function as chemical precursors to the formation of tropospheric (ground-level) ozone.

Repeated exposure to ozone may cause permanent damage to the lungs. Even at relatively low concentrations, ozone triggers a variety of health problems including chest pains, coughing, nausea, throat irritation, and congestion. It can also worsen bronchitis, heart disease, emphysema, asthma, and reduce lung capacity. Ozone interferes with the ability of plants to produce and store food, making them more susceptible to disease, insects, and other pollutants.

2. Stratospheric Ozone-depleting Substances

The earth's stratosphere extends from about 10 to 50 kilometers above the earth's surface. Most stratospheric ozone is concentrated at about 15 to 30 kilometers above the earth's surface. This ozone layer absorbs a portion of the ultraviolet (UV) radiation produced by the sun.

UV radiation is a portion of the electromagnetic spectrum with wavelengths shorter than visible light. UV radiation is commonly split into three bands: UV-A, UV-B, and UV-C. UV-A is not absorbed by ozone. UV-B is mostly absorbed by ozone, although some reaches the earth. UV-C is completely absorbed by ozone and oxygen (O_2). Depletion of stratospheric ozone allows more UV-B radiation to reach the earth's surface.

Exposure to UV-B radiation has been

linked to various skin cancers; cataracts; suppression of the human immune system; damage to crops, materials, and aquatic organisms.

Stratospheric ozone-depleting substances (ODSs) are carried intact up to the stratosphere where they break down under the effect of direct sunlight to produce radicals (reactive molecules having an unpaired electron.) The radicals released by this chemical decomposition react with ozone molecules in the ozone layer and convert them into O_2. O_2 does not have a protective effect against UV-B. Because of their chemical stability, ODSs do not break down or function in the lower atmosphere as chemical precursors to ground-level ozone.

ODSs include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, carbon tetrachloride, and methyl chloroform. Hydrofluorocarbons (HFCs), such as HFC-152a (1,1-difluoroethane), are not ODSs.

The U.S. EPA administers several voluntary and regulatory programs covering the production, phaseout, recycling, handling, and substitution of ODSs. These programs use an index called the ozone depletion potential (ODP) that indicates how many ozone molecules will be destroyed by the release of one kilogram of a given product, compared to one kilogram of CFC-11.

The ODP for CFC-11 is 1.0. HCFC-123 (2,2-dichloro-1,1,1-trifluoroethane) and HCFC-124 (2-chloro-1,1,1,2-tetrafluoroethane) have the lowest ODP (0.02) of ODSs, while Halon 1301 (bromotrifluoromethane) has the highest ODP (10.0).

HCFC-22 has an ODP of 0.05. In response to the U.S. EPA deadlines for phasing out the manufacture, import, and use of many ODSs, many industries have substituted volatile organic compounds or non-ozone depleting HFCs, such as HFC-152a, for ODSs that were historically used in their processes.

The reduction of VOC emissions from all sources is part of California's clean air strategy to achieve and maintain healthy air quality in California. Because the ELM foam sheet is manufactured without using reactive VOCs or ODSs as a blowing agent during normal operating conditions, the ARB evaluated the ELM foam sheet as air pollution control equipment.

Districts in California do not require that an air quality permit be obtained prior to the distribution, purchase, or use of a foam sheet product.

C. Health and Environmental Impacts

As part of our evaluation, staff conducted a cursory review of the potential environmental impacts associated with the ELM foam sheet. Based on this review, we concluded that the ELM foam sheet would not likely present health impacts significantly different from those associated with other foam sheets that are currently in wide use throughout California. Please note that the ELM Packaging Company and its distributors of the ELM foam sheet are required to meet all applicable health and safety standards with respect to the manufacture, storage, transport, and use

of the ELM foam sheet.

D. Manufacture/Ownership Rights
The recommendations in this report are contingent upon the ELM Packaging Company having the legal rights to produce and/or market the ELM foam sheet. The ELM Packaging Company documented its ownership of these rights in their Eligibility Request, received by the ARB on May 21, 1999.

III. SUMMARY OF SCOPE

Historically, extruded polystyrene foam sheet has been manufactured using VOCs (usually n-pentane, iso-pentane, iso-butane, and n-butane) or ODSs as the blowing agents. The ELM Packaging Company claims that by using HFC 152-a, instead of VOCs or ODSs as the blowing agent during normal manufacturing conditions, their foam sheet does not contribute to the formation of ground-level ozone or the depletion of stratospheric ozone.

IV. STATEMENT OF CLAIMS

The following are the claims verified by ARB staff concerning the ELM Packaging Company's foam sheet. The verification of these claims are predicated on the presumption that the ELM foam sheet is manufactured, transported, stored, and used in accordance with manufacturer's instructions.

1. The ELM Packaging Company does not use a blowing agent that contains volatile organic compounds (as defined by the California Air Resources Board and the United States Environmental Protection Agency) in the manufacture of its extruded polystyrene foam sheet. Therefore, the blowing agent used in the manufacture of ELM Packaging Company extruded polystyrene foam sheet does not contribute to the formation of tropospheric (ground-level) ozone.

2. The ELM Packaging Company does not use stratospheric (upper-level) ozone-depleting substances (as defined by the United States Environmental Protection Agency) as a blowing agent when it manufactures its extruded polystyrene foam sheet during normal manufacturing conditions.

V. DESCRIPTION OF TECHNOLOGY

A. Product Composition
The raw materials used to produce extruded polystyrene foam sheet include crystal polystyrene plastic resin in pellet form, a blowing agent in liquid or gaseous form, and an inorganic nucleating agent.

Among the properties that a blowing agent must possess are solubility in polystyrene plastic and an appropriate vapor pressure that will allow controlled formation of the cells in the foam sheet. (The cells in plastic foam sheet provide strength, insulation capability, and weight reduction). Non-ODS blowing agents include VOCs (usually n-pentane, iso-pentane, iso-butane, and n-butane); carbon dioxide, HFC-152a; and a blend of these substances.

The ELM Packaging Company does not use carbon dioxide as a blowing agent because its solubility in polystyrene is insufficient to achieve the product rigidity requirements of its customers. The ELM Packaging Company uses HFC-152a as the blowing agent in the production of

their foam sheet. HFC-152a is manufactured by E. I. DuPont de Nemours and Company (DuPont) under the trade name of Formacel® Z-2. The purchase price of HFC-152a from DuPont includes a license (U.S. Patent number 5,147,896) for using it as a blowing agent in the process for making polystyrene foams. In addition to HFC-152a, the ELM Packaging Company uses Dupont's Formacel® HCFC-22 (chorodifluoromethane) when restarting the extruder after any safety lockouts related to flammability concerns occur.

The purpose of the nucleating agent is to provide discontinuity sites in the molten plastic for the formation of the bubbles or cells. The ELM Packaging Company uses finely divided talc or micro-encapsulated sodium bicarbonate and citric acid, which form minute amounts of carbon dioxide within the molten polymer.

On a weight basis, the plastic represents approximately 94 to 96 percent of the raw materials, the blowing agent approximately 4 to 6 percent, and the nucleating agent is less than 0.25 percent.

B. Manufacturing Procedures

Currently, The ELM Packaging Company has three manufacturing sites (Fullerton, California; Memphis, Tennessee; and Troy, Ohio) for the production of the foam sheet that is the subject of this evaluation. In addition, The ELM Packaging Company plans to build another manufacturing facility in Phoenix, Arizona. The ELM Packaging Company has used the manufacturing process for the foam sheet described in this evaluation for six years.

The polystyrene plastic pellets that the ELM Packaging Company uses in its manufacturing process for foam sheet are either virgin material or trim (either in fluff or pellet form) material obtained in-house. The trim material can account for as much as 60 percent of the polystyrene used in the process. The ratio of virgin to trim material varies depending upon the amount of trim available at the time of production.

The polystyrene pellets (along with the nucleating agent) are introduced into a rotating screw extruder where it is melted and mixed to produce a uniform molten plastic mass at temperatures between 300 and 400 degrees Fahrenheit and pressures in the range of 2000 to 3000 (pounds per square inch (psi). The blowing agent (HFC-152a) is injected into the molten plastic at high pressure while it is still in the rotating screw extruder. The product quality is related to maintaining the proper ratio between the polystyrene beads and the blowing agent in the extruder. The plastic and blowing agent are thoroughly mixed to form a homogeneous solution. This solution is then transferred to a second rotating screw extruder, via an enclosed pipe, where it is subsequently cooled to a uniform temperature in the range of about 200 degrees Fahrenheit. The molten plastic and blowing agent solution is forced through a ring-shaped die. The solution exits the die at about 1,000 to 2,000 psi into a region of atmospheric pressure.

Upon exiting the die, the blowing agent comes out of solution and forms small bubbles, or cells, in the plastic, thus creating the foam. The foam tube is then drawn over a sizing and cooling mandrel where the plastic is solidified

and the growth of the cells is halted. The foam tube is then slit on both sides and flattened out to produce two separate polystyrene foam sheets. The sheets are then rolled up into large rolls, removed from the extrusion line, and aged for 4 to 8 days. The aging process allows ambient air to enter most of the foam cells and achieve equilibrium. No reclamation of offgassed HFC-152a is conducted.

After aging, the foam sheet is reheated and thermoformed into food service items. These items include hinged lid containers (for "take-out" from restaurants); food (poultry, produce, and meat) trays; institutional plates, bowls, platters, and lunch trays; and retail egg cartons. The items are then stacked, packaged, stored, and shipped to a series of warehouses and distribution centers until reaching the customers. The manufactured foam sheeting offgasses approximately 15 to 20 percent of the blowing agent prior to shipment from the manufacturing plant and the remaining after the various food service items are shipped.

VI. TECHNICAL EVALUATION

A. Facility Visit

As part of our evaluation, the ARB staff visited the ELM Manufacturing Company foam sheet manufacturing facility in Fullerton, California. During our visit, we observed the manufacturing practices and site layout and confirmed the ELM statements that during normal manufacturing conditions, their foam sheet is manufactured using only HFC - 152a as the blowing agent. The ARB staff confirmed that there were onsite storage facilities only for the blowing agents described in this evaluation.

As mentioned earlier, the ELM Packaging Company uses Dupont's Formacel® HCFC-22 (chorodifluoromethane) when restarting the extruder after any safety lockouts related to flammability concerns occur. Although upset conditions such as these are rare, the ELM Packaging Company maintains an onsite cylinder of HCFC-22 for these purposes.

Finally, the ARB staff confirmed that the overall manufacturing standards and practices at the ELM Packaging Company facility were being carried out as they were described in the application that had been submitted to the ARB for this evaluation.

B. Records Review

As part of our evaluation, the ARB staff reviewed the MSDS sheet for Dupont's Formacel® Z-2 and confirmed that it is indeed HFC-152a. In addition, the ARB staff reviewed bills of lading and related documents provided by the ELM Packaging Company that confirmed that the blowing agent that they receive is, in fact, HFC-152a. Finally, the ARB reviewed the ELM Packaging Company manufacturing facility employee instructions for inspecting shipping documents (which include results of independent lab analyses) to confirm the content of the bulk deliveries of HFC-152a.

VII. EVALUATION OF CLAIMS

This section presents additional information relating to the claim verified by the ARB as part of this evaluation report. Our verification of this claim is based on our evaluation of the information listed in Appendix A. As stated earlier, the ARB's evaluation and recommendations presented in this report are predicated on

the expectation that the ELM foam sheet is transported, stored, and used in accordance with the manufacturer's instructions. The claim language is precise because it directly correlates with the supporting documentation included with the application package. Below each claim are supporting comments, which may be used to interpret the significance of the claims verified in this report. To assist the reader, each portion of the claim is displayed in bold text.

1. **The ELM Packaging Company does not use volatile organic compounds (as defined by the California Air Resources Board and the United States Environmental Protection Agency) in the manufacture of its extruded polystyrene foam sheet. Therefore, the ELM Packaging Company extruded polystyrene foam sheet does not contribute to the formation of tropospheric (ground-level) ozone.**

In addition to conducting a site visit at an ELM Packaging Company manufacturing facility, the ARB staff reviewed formulation information and bill of lading records related to the production of extruded polystyrene foam sheet. Based on this information, the ARB staff has determined that destructive testing was not necessary to verify the type of blowing agent in the ELM Packaging Company polystyrene foam sheet. As such, the blowing agent used in the manufacture of the ELM Packaging Company polystyrene foam sheet is not expected to contribute to the formation of tropospheric (ground-level) ozone.

2. **The ELM Packaging Company does not use stratospheric (upper-level) ozone-depleting substances (as defined by the United States Environmental Protection Agency) when it manufactures its extruded polystyrene foam sheet during normal manufacturing conditions.**

In addition to conducting a site visit at the ELM Packaging Company manufacturing facility in Fullerton, California, the ARB staff reviewed formulation information and bill of lading records related to the production of extruded polystyrene foam sheet. Based on this information, the ARB staff determined that destructive testing was not necessary to verify the type of blowing agent used in the manufacture of the ELM Packaging Company polystyrene foam sheet. As such, the ELM Packaging Company polystyrene foam sheet is not expected to contribute to the depletion of stratospheric ozone, as a result of normal manufacturing conditions.

It should be noted, that the ELM Packaging Company is approved by the U.S. EPA to use very small amounts of Dupont's Formacel® HCFC-22 (an ozone-depleting substance) when restarting the extruder after any safety lockouts related to flammability occur. U.S. EPA allows the use of HCFC-22 as a startup substance because, currently, there are no alternative startup substances that do not pose a flammability concern. In 1999, the ELM Packaging Company's use of HCFC-22 as a startup substance averaged about 68 pounds per week at their Fullerton manufacturing facility.

VIII. QUALITY MANAGEMENT

A. Practices and Standards

The ARB staff reviewed quality management information submitted by the ELM Packaging Company. The quality objectives of the end user of foam sheet food service products relate to its ability to hold food without bending or breaking. Minimum and maximum specifications for thickness and weight are the primary quality activities that are practiced by the ELM Packaging Company. The ELM Packaging Company uses caliper measurements and batch weights to monitor the achievement of their target specifications. These specifications allow surveillance of how effectively the HFC-152a is mixed with the polystyrene beads in the extruder, and ensures that product rigidity is achieved.

The ELM Packaging Company has developed target ratios for the amount of talc and polystyrene that match the specifications that each customer outlines for their product. The operator of each extruder varies the amount of HFC-152a as needed to achieve the weight and thickness specifications established by the customer.

When the ELM Packaging Company manufacturing facilities receive a shipment of HFC-152a, it is accompanied by the results of an independent lab analysis to confirm content. During transfer of HFC-152a from a bulk delivery truck to an onsite tank, the ELM Packaging Company manufacturing site workers confirm (by inspecting shipping documents) that the correct material has been delivered.

After evaluating the quality management information provided by the ELM Packaging Company, the ARB staff has determined that sufficiently-comprehensive measures are used in the manufacturing process for the ELM foam sheet to ensure that ingredient quality, manufacturing process consistency, and finished product quality are achieved and maintained.

As part of our evaluation, the ARB staff visited an ELM foam sheet manufacturing facility in Fullerton, California. During our visit, we observed the manufacturing practices and confirmed the ELM Packaging Company's statements that under normal manufacturing conditions, their foam sheet is manufactured using only HFC-152a as the blowing agent.

B. Other Certifications/Approvals

The December 10, 1993, edition of the Federal Register announced the promulgation of a final rule amending section 178.3010 of the Food Additive Regulations (21 CFR) to permit the use of HFC-152a as a blowing agent in the manufacture of foamed polystyrene.

C. Warranties

The ELM Packaging Company will replace any product sold that is subsequently determined to not meet manufacturing specifications (i.e. if there is a manufacturing defect.)

IX. ENVIRONMENTAL AND ECONOMIC BENEFITS

As part of our review, we evaluated the potential air quality impacts of the ELM foam sheet. Under normal manufacturing conditions, most extruded polystyrene foam sheet products are produced using VOCs (usually n-pentane, isopentane, iso-butane, and n-butane) or ODSs as the blowing agents. By using

HFC 152-a, instead of VOCs or ODSs during normal manufacturing conditions, the ELM Packaging Company foam sheet blowing agent does not contribute to the formation of ground-level ozone or the depletion of stratospheric ozone. Although HFC 152-a has a global warming potential, it is an order of magnitude less than HCFC-22, the blowing agent that was previously used as the blowing agent for ELM foam sheet under normal manufacturing condtions.

X. RECOMMENDATIONS

After evaluating the information discussed in this report, the ARB staff recommends that the ELM foam sheet be precertified under its Precertification Program. Specifically, we have independently verified the claims of the ELM Packaging Company concerning its foam sheet, as presented in the claims section of the report.

By accepting Precertification under the ARB's program, the ELM Packaging Company assumes, for the duration of the three-year Precertification period, responsibility for maintaining the quality of the manufactured equipment and materials at a level equal or better than was provided to obtain this Precertification. Precertification under the ARB's program is also contingent on the recipient agreeing to be subject to quality monitoring by the ARB, as provided by law.

The ARB makes no express or implied warranties as to the performance of the manufacturer's product or equipment. Nor, does the ARB warrant that the manufacturer's product or equipment is free from any defects in workmanship or material caused by negligence, misuse, accident, or other causes. The ARB staff believes, however that the ELM Packaging Company's foam sheet will achieve the performance levels presented in the claims section of this report. Our determination is based on our evaluation of the data submitted by the ELM Packaging Company, as well as, other information identified in this report. Our recommendations are predicated on the expectation that the foam sheet is produced in accordance with manufacturer's specifications.

XI. PRECERTIFICATION CONDITIONS

The recommendations in this report are conditional upon the ELM Packaging Company foam sheet being manufactured, transported, stored, and used in accordance with the ELM Packaging Company's recommendations. In addition, these recommendations are conditional upon the ELM Packaging Company using HCFC-22 in the manufacturing process only during startup conditions after a safety lockout resulting from flammability concerns. In order for the Precertification to remain valid, the ELM Packaging Company must retain the manufacturing rights for the ELM Packaging foam sheet.

APPENDIX A

MATERIALS AVAILABLE FOR EVALUATION

APPENDIX A
MATERIALS AVAILABLE FOR EVALUATION

1. Request to Determine Eligibility for the ARB Precertification of Equipment or Processes from Mr. Jim Bartholomew of the ELM Packaging Company, received May 21, 1999.
2. Letter from Mr. Richard Corey of the ARB to Mr. Jim Bartholomew of the ELM Packaging Company notifying the ELM Packaging Company that the ELM Packaging Company extruded polystyrene sheet foam was eligible for the ARB Precertification of Equipment or Process Program and transmitting an estimate of fees required for Precertification, June 21, 1999.
3. Application for the ARB Equipment and Process Precertification Program from Mr. Jim Bartholomew of the ELM Packaging Company transmitting an application fee and the ARB Precertification Program Application, dated September 17, 1999.
4. Copy of a slide presentation from Mr. Jim Bartholomew of the ELM Packaging Company that provided general information on the ELM Packaging Company extruded polystyrene sheet foam manufacturing process, September 30, 1999.
5. Field notes from the ARB staff site visit to the ELM Packaging Company manufacturing facility at Fullerton, California, October 13, 1999.
6. Letter from Mr. Richard Corey of the ARB to Mr. Jim Bartholomew of the ELM Packaging Company notifying the ELM Packaging Company of additional information requirements needed in order to complete the ARB Equipment and Process Precertification Program application submitted by the ELM Packaging Company, October 22, 1999.
7. Letter from Mr. Jim Bartholomew of the ELM Packaging Company transmitting additional information requirements requested by the ARB, October 22, 1999.
8. Letter from Mr. Richard Corey of the ARB to Mr. Jim Bartholomew of the ELM Packaging Company notifying the ELM Packaging Company that its application was sufficiently complete, November 2, 1999.

APPENDIX B

DEFINITION OF VOLATILE ORGANIC COMPOUNDS

APPENDIX B
DEFINITION OF VOLATILE ORGANIC COMPOUNDS

The United States Environmental Protection Agency and the California Air Resources Board define volatile organic compounds as any compound that contains at least one atom of carbon, except the following exempt compounds.

acetone
ethane
methyl acetate
parachlorobenzotrifluoride (1-chloro-4-trifluoromethyl benzene)
perchloroethylene (tetrachloroethylene)
carbon monoxide
carbon dioxide
carbonic acid
metallic carbides or carbonates
ammonium carbonate
methane
methylene chloride (dichloromethane)
1,1,1-trichloroethane (methyl chloroform)
trichlorofluoromethane (CFC-11)
dichlorodifluoromethane (CFC-12)
1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)
1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114)
chloropentafluoroethane (CFC-115)
chlorodifluoromethane (HCFC-22)
1,1,1-trifluoro-2,2-dichloroethane (HCFC-123)
1,1-dichloro-1-fluoroethane (HCFC-141b)
1-chloro-1,1-difluoroethane (HCFC-142b)
2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)
trifluoromethane (HFC-23)
1,1,2,2-tetrafluoroethane (HFC-134)
1,1,1,2-tetrafluoroethane (HFC-134a)
pentafluoroethane (HFC-125)
1,1,1-trifluoroethane (HFC-143a)
1,1-difluoroethane (HFC-152a)
cyclic, branched, or linear completely methylated siloxanes
cyclic, branched, or linear, completely fluorinated alkanes
cyclic, branched, or linear, completely fluorinated ethers with no unsaturations
cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations
sulfur-containing perfluorocarbons with no unsaturations and with the sulfur bonds to carbon and fluorine